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IS 5577 (2000): Automotive Vehicles - Ammeters [TED 11:
Automotive Electrical Equipment]



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भारतीय मानक
स्वचल वाहन — मोटर वाहनों के लिये
एम्मीटर — विशिष्टि
(दूसरा पुनरीक्षण)

Indian Standard
AUTOMOTIVE VEHICLES — AMMETERS —
SPECIFICATION
(*Second Revision*)

ICS 43.040.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Automotive Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

This Indian Standard was first published in 1970 and revised in 1982. The second revision was taken up to bring its contents in line with the requirements of other International Standards.

In preparing this standard, considerable assistance has been derived from JIS D 5604 : 1973 'Ammeters for automobiles', published by the Japanese Standards Association.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The composition of the committee responsible for formulation of this standard is given in Annex C.

Indian Standard

AUTOMOTIVE VEHICLES — AMMETERS — SPECIFICATION (*Second Revision*)

1 SCOPE

1.1 This standard covers the design and performance characteristics of moving magnet type ammeters to indicate the rate of charge and discharge of automobile storage batteries including those on trucks and tractors. However, ammeters for motor cycles and scooters are not covered by this standard.

1.2 In case of ammeter on cluster units the requirements are applicable only for ammeters.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
4905 : 1968	Methods for random sampling
10250 : 1982	Severities for environmental test for automotive electrical equipments

3 TERMINOLOGY

3.0 For the purpose of this standard the following definitions shall apply.

3.1 Effective Range

That part of the scale where measurements can be made with stated accuracy.

3.2 Error in Indication

The difference between the indicated value and the true value of the quantity measured. The error is positive if the indicated value is greater, and negative if it is smaller than the true value.

3.3 Full Scale Value

The higher of the value associated with the scale end marks.

3.4 Scale Division

Interval between two successive scale marks.

3.5 Scale Length

The length of the arc measured between two extreme end marks of the scale along the bottom of the short scale marks over which the pointer shall traverse.

3.6 Scale Mark

A number of marks by which it is possible to register the position of the pointer of the instrument.

3.7 Scale Range

The number of units indicated on the scale between the two end marks of the scale.

3.8 Type Tests

Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of a given type of ammeter.

3.9 Acceptance Tests

Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

3.10 Routine Tests

Tests carried out on each ammeter to check requirements which are likely to vary during production.

4 DESIGN AND CONSTRUCTION

4.1 Graduation

While facing the dial, the right hand side, in principle, shall be the charged side. The unit of graduation shall be ampere (A). The terminals on the reverse side shall be marked '+L' and '+B' in order to indicate the charging condition when current flows from '+L' to '+B'.

4.1.1 Preferred ranges shall be as given below:

– 150	+	15 A
– 300	+	30 A
– 500	+	50 A
– 600	+	60 A
– 800	+	80 A

4.2 Terminals

Studs or bolts projecting out of the housing to which connections are made shall be completely insulated from the housing. The terminals shall be made of brass only.

4.3 Illumination

The instrument shall be made with or without arrangements for illumination, as per the requirement of the purchaser.

4.4 Mounting

The mounting arrangement shall be such as to facilitate its fixing from the front side by clamping it with a suitable nut and bracket arrangement.

5 DIMENSIONS

The diameter of the case or housing shall be 52 mm or 60 mm. All other dimensions including those of the mounting accessories shall be as shown in Fig. 1. This does not apply to non-circular ammeters and ammeters used on clusters.

6 TESTS

6.1 Classification of Tests

6.1.1 Type Tests

The following shall constitute type tests:

- Visual examination (*see 6.2*),
- Accuracy test (*see 6.3*),
- High voltage (flash) test (*see 6.4*),
- Continuous load test (*see 6.5*),

- Overload test (*see 6.6*),
- Vibration test (*see 6.7*),
- Cold test (*see 6.8*),
- Dry heat test (*see 6.9*),
- Damp heat (cycling) test (*see 6.10*),
- Drop test (*see 6.11*),
- Rapid change of temperature test (*see 6.12*),
- Water spray test (*see 6.13*), and
- Endurance test (*see 6.14*).

6.1.1.1 Criteria for approval

Eight samples shall be submitted together with the relevant data. These shall be tested according to the test sequence of tests given in Annex A. The testing authority shall issue a type approval certificate if the ammeters are found to comply with the requirements of tests given in 6.1.1.

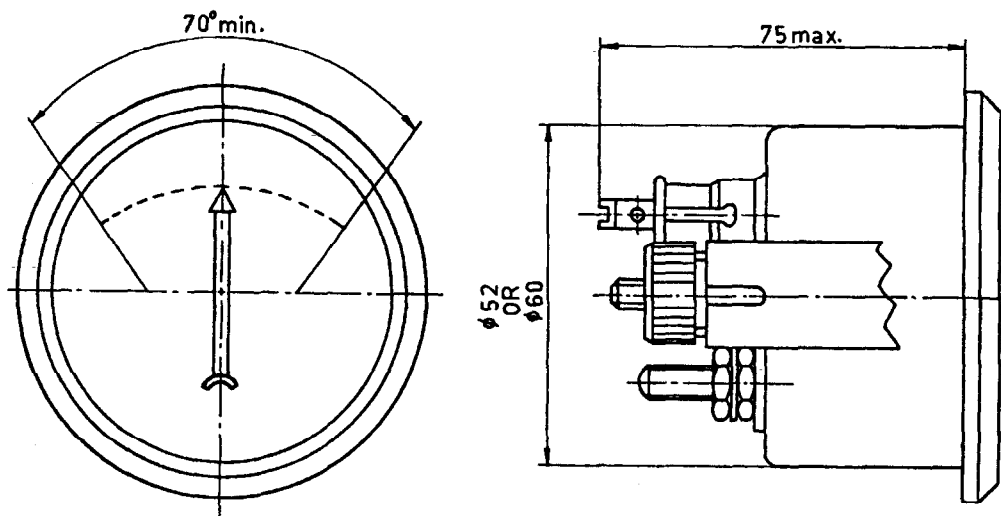
6.1.1.2 In case of failure in one or more type tests, the testing authority may call for fresh samples not exceeding twice the number of original samples and subject them to test(s) in which failure occurred. If in repeat test(s) no failure occurs, the tests may be considered to have been satisfactory.

6.1.2 Acceptance Tests

The following shall constitute acceptance tests:

- Visual examination (*see 6.2*),
- Accuracy test (*see 6.3*), and
- High voltage (flash) test (*see 6.4*).

6.1.2.1 The number of samples for acceptance tests shall be as agreed by the manufacturer and the



All dimensions in millimetres.

FIG. 1 MOUNTING DIMENSIONS FOR AMMETER

purchaser. However, a recommended plan of sampling is given in Annex B.

6.1.3 Routine Test

The following shall constitute routine tests:

- a) Visual examination (*see* 6.2),
- b) Accuracy test (*see* 6.3), and
- c) High voltage (flash) test (*see* 6.4).

6.2 Visual Examination

The external components as well as dial shall be visually examined for surface defects. The dial characteristics, colour, styling and printing shall be subject to the agreement between the manufacturer and the purchaser.

6.3 Accuracy Test

6.3.1 Initial Error

When no current flows the permissible variation shall be ± 2 percent of the full scale deflection from the zero position.

6.3.2 Tolerance on Indication

Tolerance for every indicated value falling within the effective range shall be within ± 6 percent of the full scale value or ± 2 A, whichever is greater, when measured at $25 \pm 5^\circ\text{C}$.

6.3.3 Damping

When the current is cut off from the position of two-thirds of the full scale value, the pointer shall come to zero and be standstill within three seconds at a position, depending on the initial error as indicated in 6.3.1.

6.3.4 Overshoot

When the instrument is energized to indicate a particular value, the overshoot shall not exceed the final steady deflection of the particular value by more than 20 percent of the full scale deflection.

6.3.5 The accuracy test shall be checked keeping the instruments angle as fitted in the vehicle.

6.4 High Voltage (Flash) Test

The ammeter shall be subjected to a flash test at 500 V ac rms at a convenient frequency of 40 to 60 Hz between each of the terminals and the cover. It shall satisfactorily withstand this test without arcing or puncture.

6.5 Continuous Load Test

When a current of maximum graduated value is passed

through the ammeter for 30 minutes, there shall be no damage.

6.5.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.6 Overload Test

When the instrument is subjected to overload test by applying twice the full load value for maximum of one second, there shall be no damage.

6.6.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.7 Vibration Test

The ammeter after being rigidly mounted on a suitable vibrating machine constructed to produce simple harmonic motion shall be subjected to vibration (a total lift of 0.7 mm) through a frequency range of 10-55-10 Hz in a period of one minute. With continuously varying frequencies the vibration shall be applied for not less than one hour in each of the three major axes of the ammeter. At the end of the vibration test the ammeter shall be examined for any evidence of the damage and shall be subjected to high voltage (flash) test (6.4), and accuracy test (6.3). The permissible variation of the observed value shall be with ± 2 percent of the initial value.

6.8 Cold Test

This test shall be carried out according to IS 10250 with a gradual change in temperature under the following conditions:

Temperature	$-10 \pm 3^\circ\text{C}$
Duration of exposure	2 hours

6.8.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.9 Dry Heat Test

This test shall be carried out according to IS 10250 with gradual change of temperature under the following conditions:

Temperature	$55^\circ\text{C} \pm 3^\circ\text{C}$
Duration of exposure	4 hours

6.9.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation of the observed value shall be ± 2 percent of the initial value.

6.10 Damp Heat (Cycling) Test

This test shall be carried out according to IS 10250. The number of conditioning cycles shall be seven.

6.10.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.11 Drop Test

This test shall be conducted as specified in IS 10250. The test conditions shall be as given below:

- a) Number of drops 6
- b) Drop height 25 mm

6.11.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.12 Rapid Change of Temperature Test

This test shall be carried out as per IS 10250. The ammeter shall be exposed to the following conditions:

Cold (minimum) temperature	$-10 \pm 3^\circ\text{C}$
Hot (maximum) temperature	$+55 \pm 2^\circ\text{C}$
Number of cycles	2
Duration (t_1)	30 min

6.12.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.13 Water Spray Test

The ammeter shall be subjected to this test as specified in IS 10250, exposing only the front parts for two hours. All ports or openings shall be suitably sealed, except in case of waterproof ammeters.

6.13.1 After this test, the ammeter shall satisfy the requirements specified in 6.3.2 and 6.4. The permissible variation in the observed value shall be ± 2 percent of the initial value.

6.14 Endurance Test**6.14.1 Test Rig**

The test rig used for the endurance test for ammeter shall be as given in Fig. 2.

6.14.2 Cycle

A current of full scale reading of the ammeter is passed through the instrument, resulting in full scale deflection in the positive direction and then it is switched off. Again the current is reversed for a full scale deflection in the negative direction and switched off. This constitutes a complete cycle.

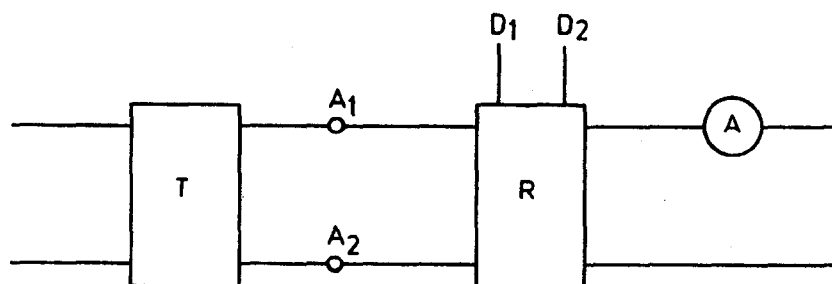
6.14.3 The ammeter shall be operated continuously for 100 000 cycles at the rate of 20 cycles per minute and examined for undue wear or breakage of components.

6.14.4 After this test, the ammeter shall satisfy the requirements specified in 6.3.2. The permissible variation in the observed value shall be ± 2 percent of the initial value.

7 MARKING

7.1 The ammeter shall be marked with the following:

- a) Indication of the source of manufacture or trade-mark or both;
- b) Country of manufacturer, if preferred by the purchaser;
- c) Month and year of manufacture;
- d) The symbol for the quantity measured; and
- e) + L and + B for the terminals.



NOTE — T is a timer operating a reversing relay through its coil terminals A₁ and A₂. D₁ and D₂ are the supply terminals of a suitable DC source for passing the current through the ammeter under test. The current through the ammeter should be adjustable.

FIG. 2 TEST RIG FOR ENDURANCE TEST

7.1.1 The ammeters may also be marked with the Standard Mark.

7.1.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*,

1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(Clause 6.1.1.1)

SEQUENCE OF TESTS FOR TYPE APPROVAL

Clause No.	Test	Sequence							
		1	2	3	4	5	6	7	8
6.2	Visual examination	x	x	x	x	x	x	x	x
6.3	Accuracy test	x	x	x	x	x	x	x	x
6.4	High voltage (flash) test	x	x	x	x	x	x	x	x
6.5	Continuous load test	x							
6.6	Overload test	x							
6.7	Vibration test		x						
6.8	Cold test			x					
6.9	Dry heat test			x					
6.10	Damp heat (cycling) test				x				
6.11	Drop test					x			
6.12	Rapid change of temperature test					x			
6.13	Water spray test						x		
6.14	Endurance test							x	x

x Sample to be tested.

ANNEX B

(Clause 6.1.2.1)

RECOMMENDED SAMPLING PLAN FOR ACCEPTANCE TESTS**B-1 LOT**

B-1.1 In a consignment, the ammeters of the same type and rating and manufactured under similar conditions of production in the same factory shall be grouped together to constitute a lot.

B-1.2 The number of ammeters to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

B-1.2.1 The ammeter shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS 4905 may be followed.

B-2 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

All ammeters selected from the lot at random according to col 1 and 2 of Table 1 shall be subjected

to the acceptance tests. An ammeter failing to meet the requirements of any of the acceptance tests shall be termed as defective. The lot shall be considered as conforming to the requirements of the acceptance tests if the number of defectives is less than or equal to corresponding acceptance number given in col 3 of Table 1; otherwise the lot shall be rejected.

Table 1 Sample Size and Acceptance Number
(Clauses B-1.2 and B-2.1)

Lot Size	Sample Size	Acceptance Number
(1)	(2)	(3)
Up to 100	8	0
101 to 300	13	0
301 to 500	20	1
501 to 1 000	32	2
1 001 and above	50	3

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

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(Continued on page 7)

(Continued from page 6)

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

Telephone

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 323 76 17 323 38 41
Eastern	: 1/14 C. I.T. Scheme VII M, V. I. P. Road, Kankurgachi CALCUTTA 700 054	{ 337 84 99, 337 85 61 337 86 26, 337 91 20
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